

What is Claimed Is:

1. A method of operating a boiler system having a plurality of stages which may be active or inactive at a given time, the stages having outputs, the method comprising:

performing a staging sequence to determine how many of the plurality of stages should be active;

modulating a first stage to operate at less than 100% of its output; and

modulating a second stage to operate at less than 100% of its output.

2. The method of claim 1 wherein each of the plurality of stages is an individual boiler, and wherein the step of performing a staging sequence determines how many individual boilers should be active.

3. The method of claim 1 further comprising the step of performing a selecting sequence to determine which of the stages should be active.

4. The method of claim 3 wherein the selecting sequence includes a first on/first off method.

5. The method of claim 3 wherein the selecting sequence is adapted to equalize the time in which the stages are active.

6. A controller for a boiler system, the controller configured to perform the steps of claim 5.

7. A controller for a boiler system, the controller configured to perform the steps of claim 1.

8. A method of providing heat capacity in response to a heat load using a boiler system having a plurality of stages that may be active or inactive at a given time, the method comprising:

performing a staging sequence to determine which of the plurality of stages should be active or inactive; and
modulating the active stages.

9. The method of claim 8 wherein the step of modulating the active stages includes modulating each active stage to substantially the same level of modulation.

10. The method of claim 8 wherein the step of modulating the active stages includes sending a modulation signal to each of the active stages from a single controller.

11. A controller for a multi-boiler system, the controller configured to perform the steps of claim 8.

12. A method of operating a boiler system having a plurality of stages which may be active or inactive at a given time, the method comprising:

performing, at a first interval, a staging sequence to determine how many of the stages should be active;

performing, at a second interval shorter than the first interval, a modulating sequence to modulate the active stages.

13. The method of claim 12 wherein the staging sequence includes a sub-method for making an inactive stage active and a sub-method for making an active stage inactive, wherein:

the sub-method for making an inactive stage active is disabled for a first time period after an inactive stage is made active;

the sub-method for making an active stage inactive is disabled for a second time period after an active stage is made inactive; and

the second time period is shorter than the first time period.

14. A controller for a boiler system, the controller configured to perform the steps of claim 13.

15. The method of claim 12 wherein the boiler system includes a number of separate boilers, wherein each boiler represents a stage.

16. A controller for a boiler system, the controller configured to perform the steps of claim 12.

17. A method of controlling a multi-stage boiler system having a number of stages that can be either active or inactive, the method comprising:

determining whether to make an inactive stage active; and

determining whether to make an active stage inactive; wherein:

a first delay is provided after making an inactive stage active,

a second delay is provided after making an active stage inactive, and

the first delay is longer than the second delay.

18. A method of staging and modulating a boiler system in response to a load comprising:

staging and modulating the system using a first control method that is adapted for achieving increased efficiency under a first set of conditions;

staging and modulating the system using a second control method that is adapted to allow cycling of the stages under a second set of conditions.

19. The method of claim 18 wherein at least one of the second set of conditions is that the load exceeds a threshold.

20. The method of claim 18 wherein at least one of the second set of conditions is that the system has operated by staging and modulating using the first control method for a predetermined time period.

21. The method of claim 18 wherein the first set of conditions includes non-occurrence of all of the second set of conditions.

22. The method of claim 18 wherein at least one of the first control method or the second control method includes:

performing, at a first interval, a staging sequence to determine how many of the stages should be active;

performing, at a second interval shorter than the first interval, a modulating sequence to modulate the active stages.

23. The method of claim 18 wherein at least one of the first control method and/or the second control method includes a sub-method for making an active stage inactive and a sub-method for making an inactive stage inactive, wherein:

the sub-method for making an inactive stage active is disabled for a first time period after an inactive stage is made active;

the sub-method for making an active stage inactive is disabled for a second time period after an active stage is made inactive; and

the second time period is shorter than the first time period.

24. A boiler system comprising:

a controller configured to perform the method of claim 18; and

a switch;

wherein the first set of conditions includes having the switch in a first configuration, and the second set of conditions includes having the switch in a second configuration, the switch adapted to allow a user to select one of the first configuration or the second configuration.

25. A method of performing a staging sequence for a multi-stage boiler system in which at least one stage can be either active or inactive, the method comprising:

- observing an error measured as a difference between a temperature and a setpoint;
- observing a rate of change of the error; and
- combining the error and the rate of change of error to determine whether:
 - an inactive stage should become active;
 - an active stage should become inactive; or
 - no change in the number of active stages is necessary.

26. A controller for a boiler system, the controller configured to perform the method of claim 25.